Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Using Depth of Disturbance Rods as a Tool to Target Sediment Sample Locations in a River Potentially Impacted by an Oil Spill

Matrix Solutions Inc.

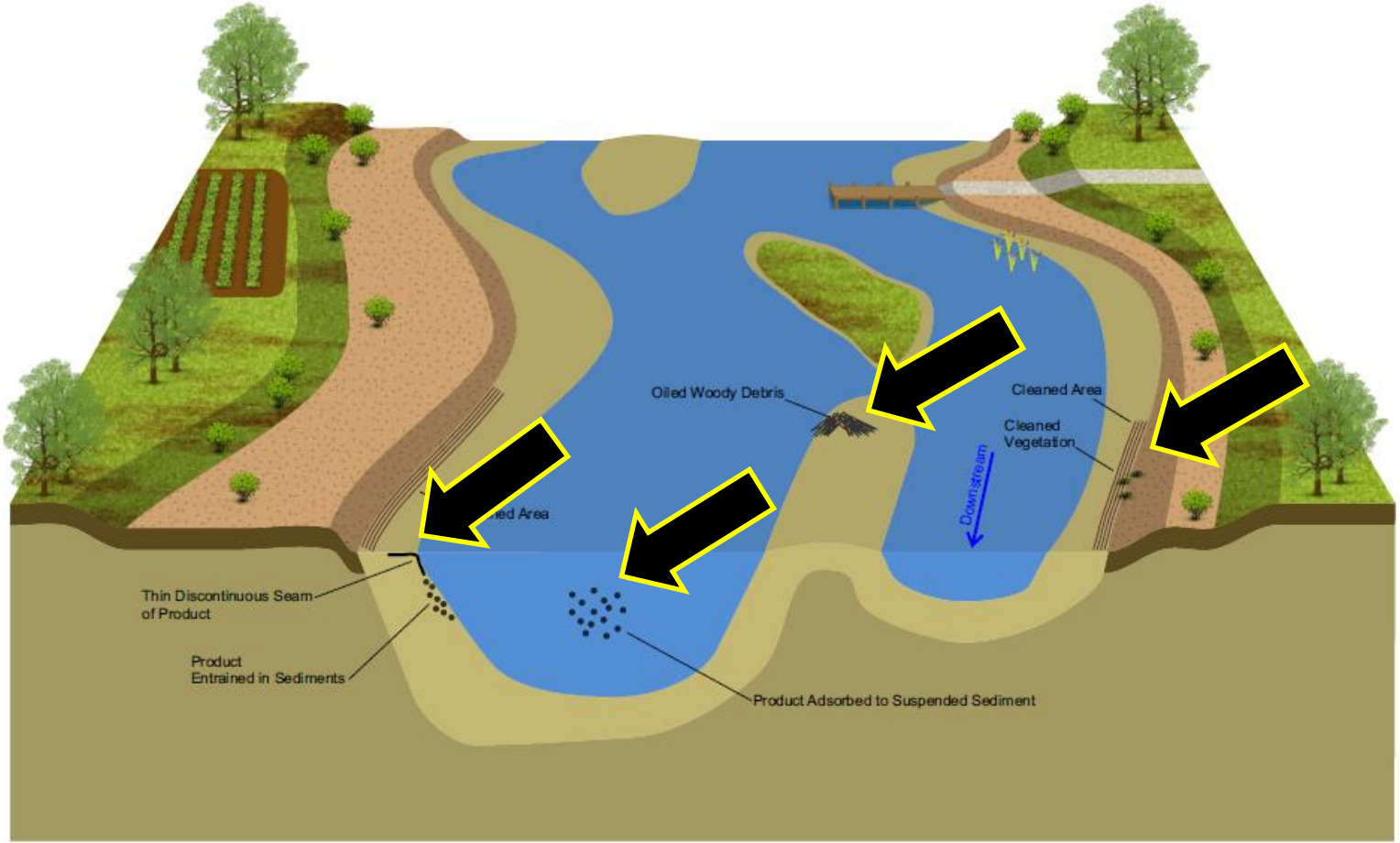
Integrated Services • Innovative Solutions

Outline

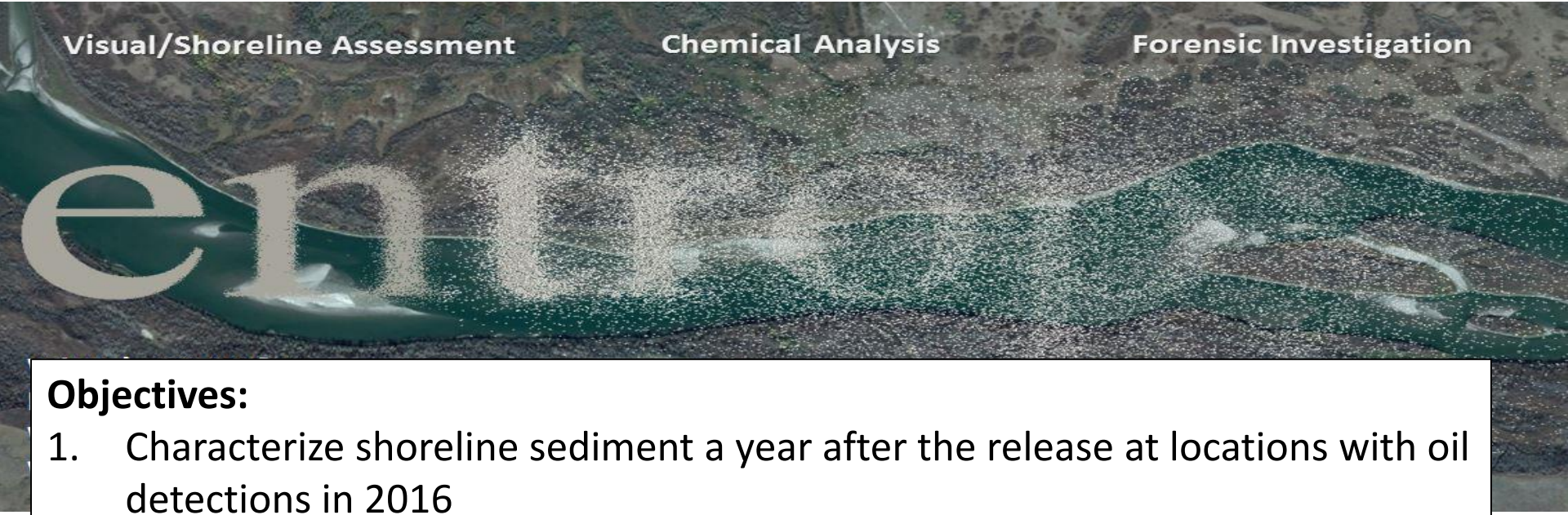
- Recap of the Oil Spill
- Objectives
- Methods
- Results
- Conclusions
- Challenges and Learnings

Overview of the Oil Spill

Residual Distribution



How do you Characterize over 600 km of River?



Objectives:

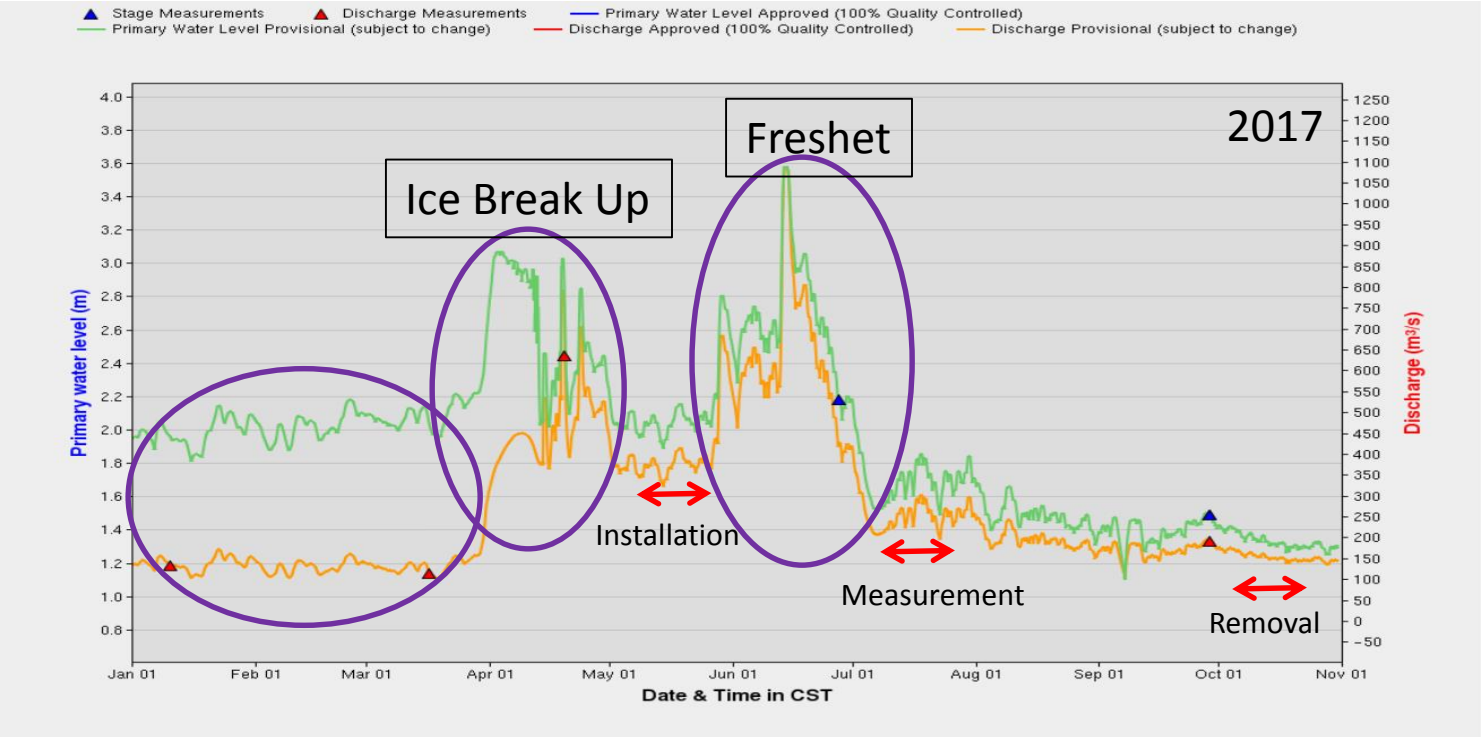
1. Characterize shoreline sediment a year after the release at locations with oil detections in 2016
2. Determine degree of entrainment in the sediment column

Methods – Field Locations

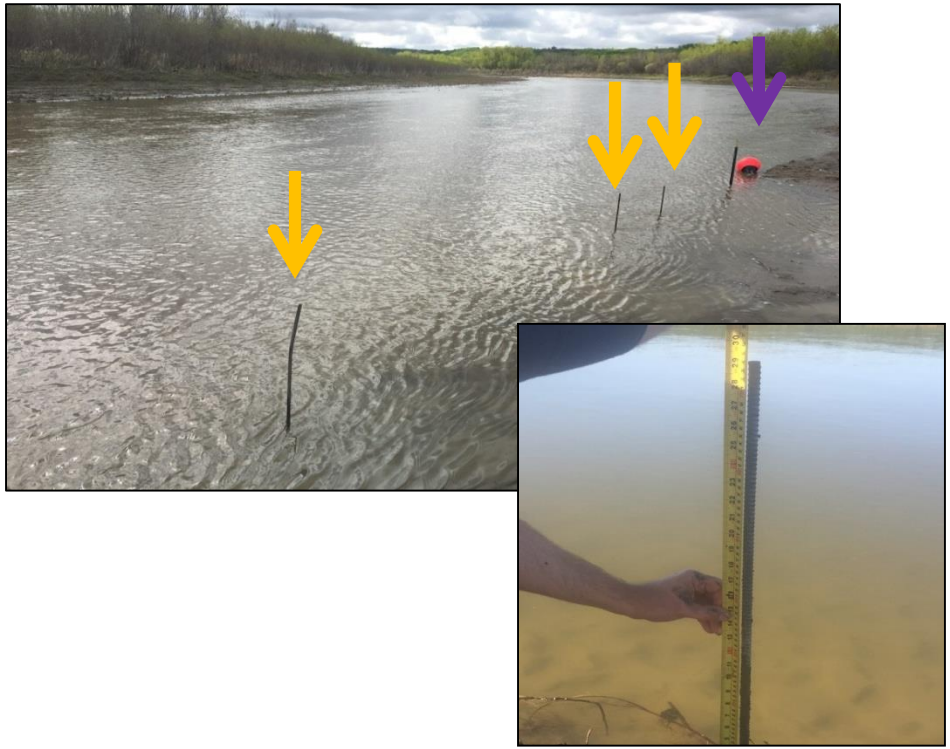
- Identifying residual oil properties
- Desktop study to determine depositional reaches of the river
- 48 locations covering over 600 km of river

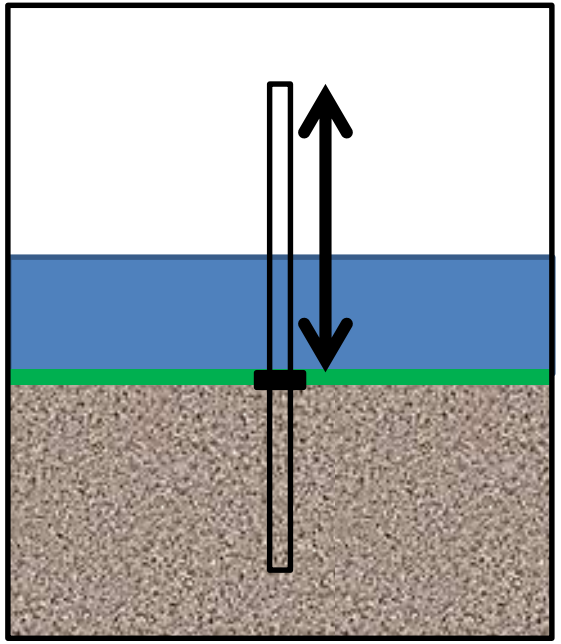
Methods - Field Timing

2017 Hydrograph (NSR @ Deer Creek)



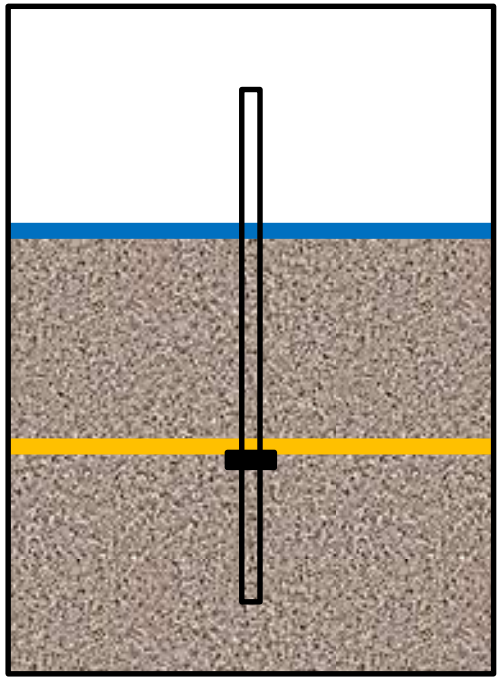
How do they Work? - Installation





Installation depth

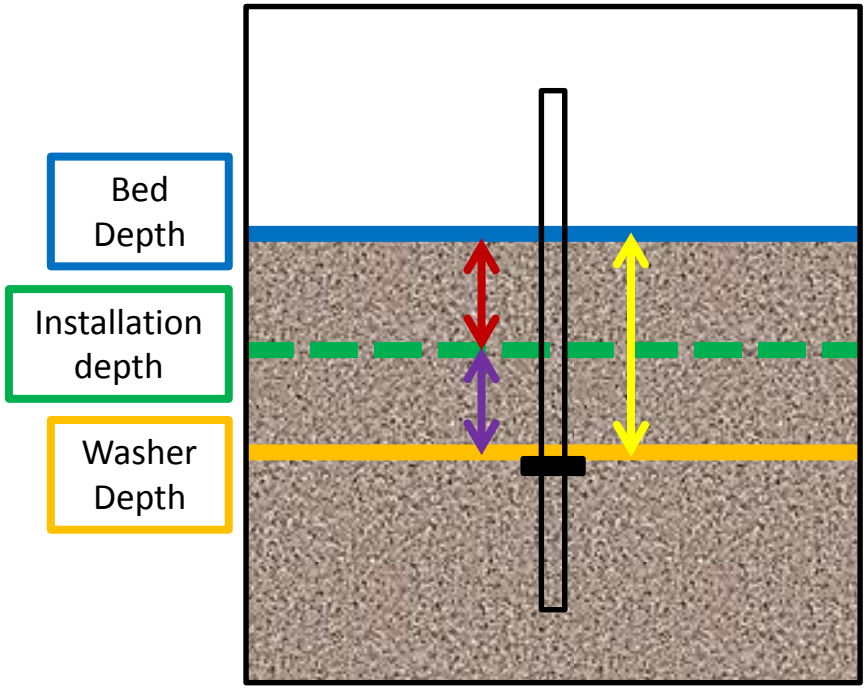
How do they Work? - Measurement



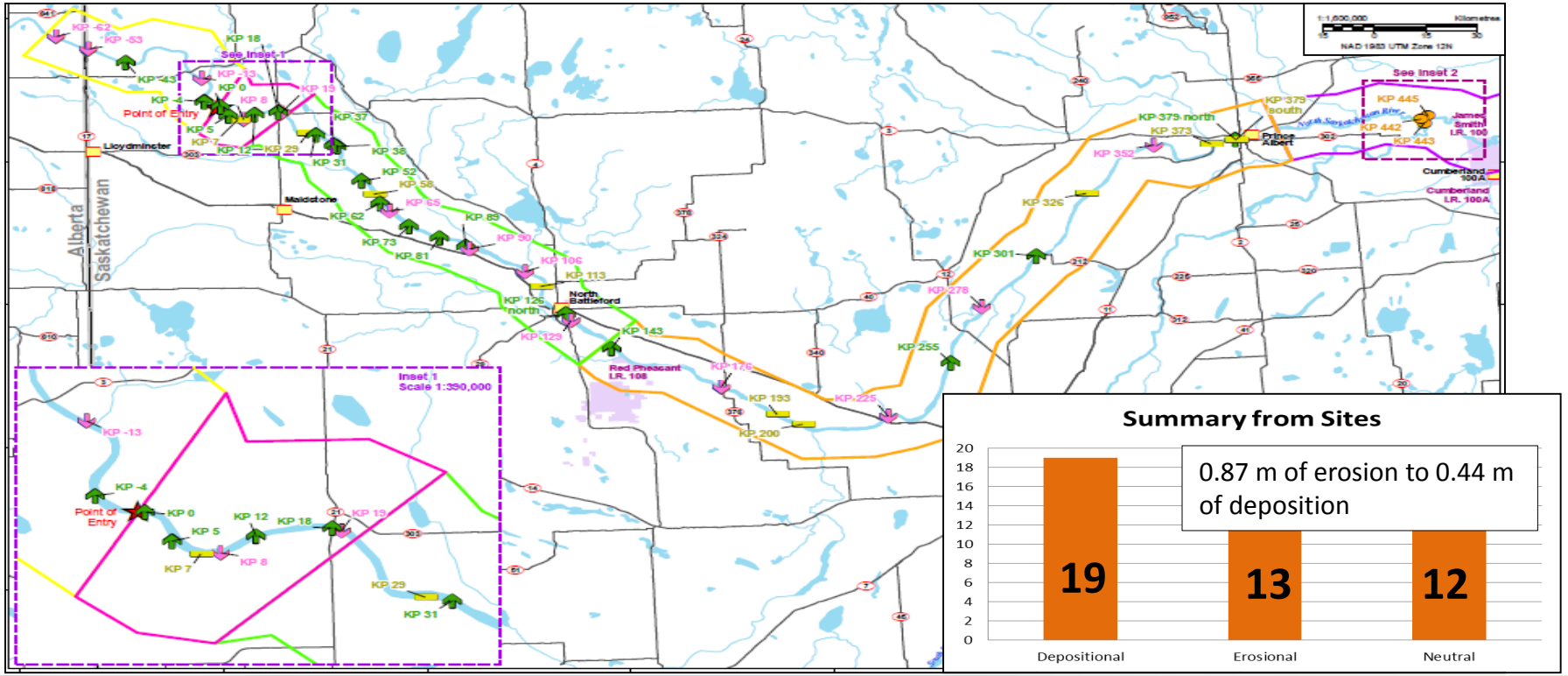
Bed Depth

Washer Depth

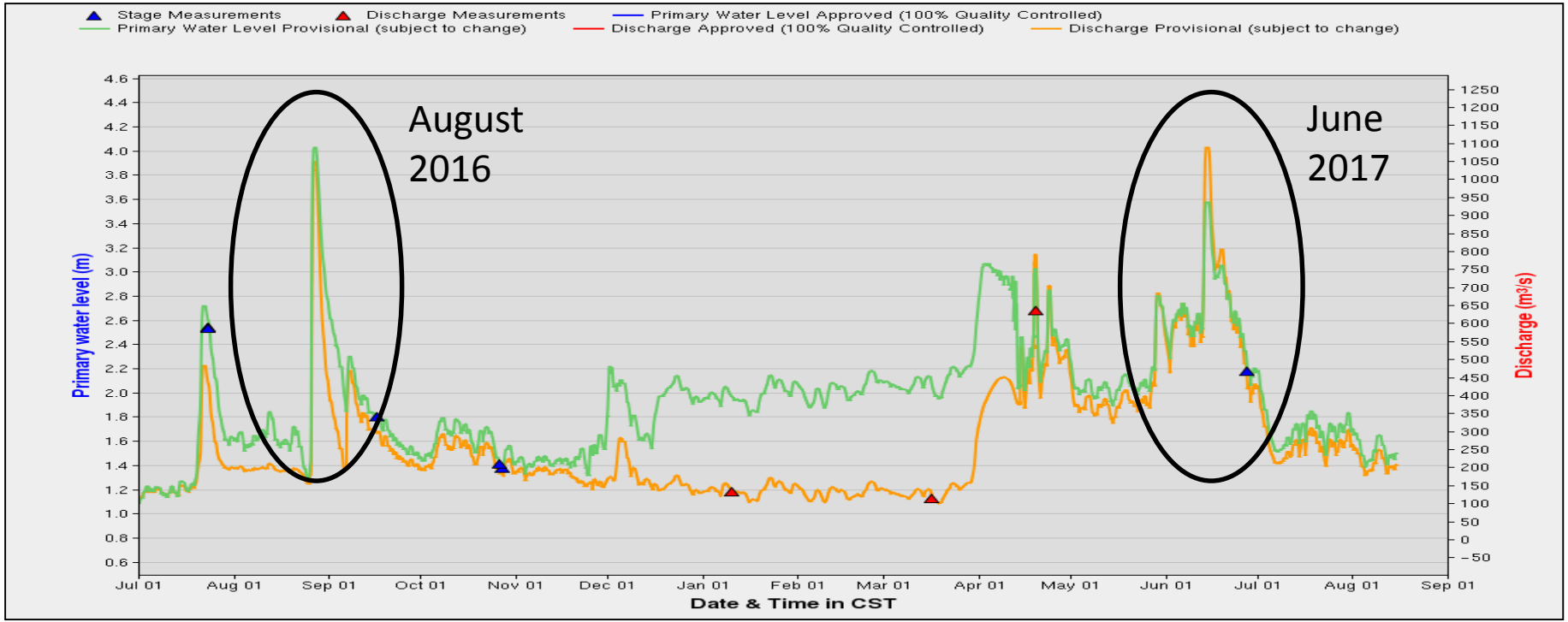
How do they Work? - Analysis



Results Summary



Interpretation- Finding Residual Oil



Interpretation- Finding Residual Oil

Location	Depth of Disturbance (scour/ deposition)	Acculumation (Washer to Bed)	Bed Depth Change (May to July)	Est. depth of residual oil	Est. depth of residual oil + FS (10%)	Sediment Coring Depth Target	Label
KP52	-13	24	11	**22**	24.2	**60cm (0-20, 20-40,40-60)**	Depositional
KP52	-11	24	13	**26**	28.6		Depositional
KP52	-7	20	13	**26**	28.6		Depositional

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KP52	-7	20	13	**26**	28.6		Depositional
KP113	-6	5	-1	-2		**45cm (0-15, 15-30,30-45)**	Neutral
KP113	-6	6	0	0			Neutral
KP113	-4.5	4.5	0	0			Neutral

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KP113	-6	5	-1	-2		**45cm (0-15, 15-30,30-45)**	Neutral
KP113	-6	6	0	0			Neutral
KP113	-4.5	4.5	0	0			Neutral
KP8	-25.5	19.5	-6	-12		**45cm (0-45)**	Erosive
KP8	-19	12	-7	-14			Erosive
KP8	-19	12	-7	-14			Erosive

Interpretation

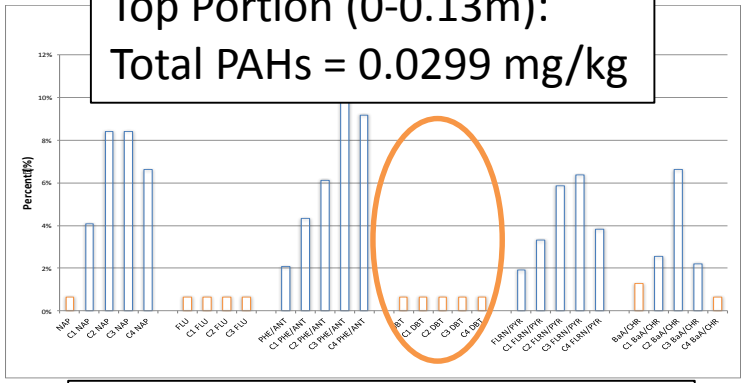
- Depositional locations could contain residual oil within the top and middle core layers
- Net neutral locations residual oil likely limited to top core layer
- Erosive locations low potential for residual oil (moved for sediment sampling)

Results – Example

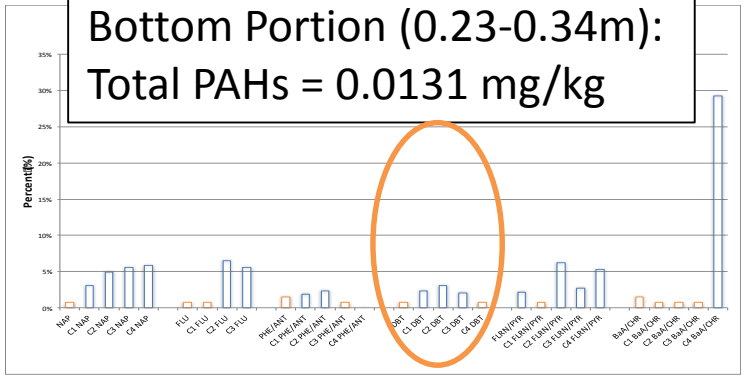
Sample Site	17-CR008T	17-CR008M	17-CR008B
Sample Depth (m)	0-0.12	0.13-0.23	0.24-0.34
Date	21-Jul-17	21-Jul-17	21-Jul-17
Nutrients			
Organic Matter	1.1	1.3	0.79
Total Organic Carbon	0.66	0.78	0.46
Physical Characteristics			
Sand	75	64	92
Silt	18	21	6
Clay	6.5	15	2.3
Classification (CSSC)	Sandy Loam	Sandy Loam	Sand
Sieve #200 (>75µm)	67	48	86
Classification***	Coarse	Fine	Coarse

Results - Example

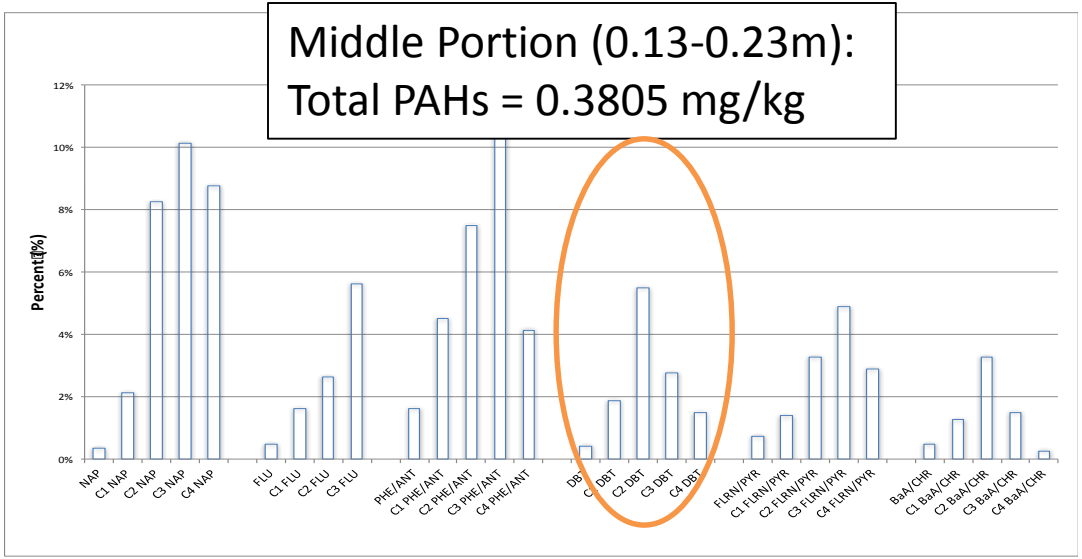
Top Portion (0-0.13m):
Total PAHs = 0.0299 mg/kg



Bottom Portion (0.23-0.34m):
Total PAHs = 0.0131 mg/kg



Middle Portion (0.13-0.23m):
Total PAHs = 0.3805 mg/kg



Challenges

- Regulations of a navigable watercourse
- Public Areas
- Characterizing a spatial extent of > 600km of river
- Field Timing
- Characterizing sediment dynamics from two Hydraulic Events
  - August 2016 high flow
  - June 2017 freshet

Conclusions

1. Characterize shoreline sediment a year after the release at locations with oil detections in 2016
   - No measurable oil in depositional areas sampled where oil was detected in 2016
2. Determine degree of entrainment in the sediment column
   - No oil entrained more than 20 to 25 cm (if found)

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Questions?

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